THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 35

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte RYOICHI NAKATANI,
MASAHIRO KITADA and
YUZURU HOSOE

_____

Appeal No. 95-1626
Application 07/804,013[1]

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HEARD: February 3, 1998

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Before JERRY SMITH, BARRETT and FLEMING, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

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[1] Application for patent filed December 9, 1991.

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's rejection of claims 1-45, which constitute all the claims in the application. A first amendment after final rejection was filed on May 24, 1994 but was denied entry by the examiner. A second amendment after final rejection was filed contemporaneously with the appeal brief and was entered as the result of a decision on petition [Paper #24].

The disclosed invention pertains to a magnetoresistive (MR) element. The MR element of the invention is comprised of a multilayer film having ferromagnetic and nonferromagnetic layers layered on each other. A particular feature of the invention relates to the manner in which a magnetic bias field is applied to the MR element to give the element desired properties.

Representative claims 1 and 4 are reproduced as follows:

1. A magnetoresistive element, comprising a multilayer film having ferromagnetic layers and nonferromagnetic layers layered on each other, wherein a nonferromagnetic layer is formed on the multilayer film, a permanent magnet layer is formed on the nonferromagnetic layer, on the multilayer film, and a bias field generated by said permanent magnet layer is applied to the multilayer film.

4. A magnetoresistive element, comprising a multilayer film having ferromagnetic layers and nonferromagnetic layers layered on each other, wherein an angle between a hard axis direction of the multilayer film and a direction for detecting an external magnetic field to be detected by the magnetoresistive element is 10E or less when no bias field is applied to the multilayer film.

The examiner relies on the following reference:

T. Shinjo et al. (Shinjo), "Large Magnetoresistance of Field-Induced Giant Ferrimagnetic Multilayers," Journal of The Physical Society of Japan, Vol. 59, No. 9, Sept. 1990, pages 3061-3064.

Claims 1-45 stand rejected under 35 U.S.C. § 112, first and second paragraphs, as being based on an inadequate disclosure and/or for failing to particularly point out and distinctly claim the invention. Claims 1-3 and 6-45 also stand rejected under 35 U.S.C. § 101 as being directed to an inoperative invention and, therefore, lacking utility. Finally, claims 1-45 stand further rejected under 35 U.S.C. § 103. As evidence of obviousness the examiner offers Shinjo taken alone.

Rather than repeat the arguments of appellants or the examiner, we make reference to the briefs and the answers for the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner, the arguments in support of the rejections and the evidence of obviousness relied upon by the examiner as support for the obviousness rejection. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' arguments set forth in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answers.

It is our view, after consideration of the record before us, that the disclosure in this application describes the claimed invention in a manner which complies with the requirements of 35 U.S.C. § 112. We are also of the view that the claims particularly point out the invention in a manner which also complies with 35 U.S.C. § 112. We are further of the view that the claims are properly directed to an operative invention and, therefore, possess the disclosed utility. Finally, we are of the view that the evidence relied upon and the level of skill in the particular art would not have suggested to one of ordinary skill in the art the obviousness of the invention as set forth in claims 1-3, 5-25, 28, 34 and

36-45, however, the prior art would have suggested the obviousness of the invention as set forth in claims 4, 26, 27, 29-33 and 35. Accordingly, we affirm-in-part.

1. The rejection of claims 1-45 under the first and second paragraphs of 35 U.S.C. § 112 [answer, pages 3-6].

The examiner has formulated this rejection in paragraphs labeled A) to H), and appellants have responded to the rejection in the same manner. Therefore, we will also consider the positions of the examiner and appellants in paragraphs labeled to be consistent with their use by the parties.

A) The examiner argues that there is no structure to provide the bias field of claims 1-5 or the current of claim 3. The examiner also questions how a bias field is applied to the multilayer when the source is a layer of the film. Appellants respond that the bias field of claim 1, for example, is a permanent magnet mounted on the multilayer. Appellants also indicate how the various bias fields and currents arise in the multilayer device. We agree with appellants for the reasons given by them. We see no lack of clarity caused by the source of the bias field being either

attached to the MR element or as one of the layers thereof. Either way, a bias field can be applied to the multilayer MR element. In addition, we note that the bias field is applied by a permanent magnet in claim 1. The bias field is applied by a current flowing in the nonferromagnetic metal layer in claim 3. It does not matter how the current was generated for claim definiteness. Claim 5 specifically recites a means for applying a bias field. Thus, the scope of the claims is not rendered indefinite by the recitation of a bias field or of a current.

B) The examiner questions whether an external magnetic field is required in claims 4 and 5. With respect to claim 4, we agree with appellants that it simply recites the relationship between hard axis direction of a multilayer film and an external magnetic field to be detected by the MR element. With respect to claim 5, the specification makes it clear that the bias field changes the characteristics of the MR element such as by attaching a permanent magnet thereto, whereas the magnetic field to be detected refers to an externally applied magnetic field. The scope of these claims is clear when they are read in light of the specification.

C) The examiner argues that the direction in claim 2 is unclear and indefinite. We do not agree. Claim 2 simply recites that the bias field which is applied by the permanent magnet should be smaller than the field strength of the MR element at maximum resistance, and that the direction of the bias field is inverse to the direction of magnetization of the permanent magnet. These directions being inverse are clear as shown by the sketch attached to the reply brief. The permanent magnet causes a magnetic field to exist in the layers which is in the reverse direction of the magnetic field within the magnet itself.

D) The examiner asserts that it is unclear how a nonferromagnetic layer can be magnetoresistive as recited in claim 14. As appellants point out, however, claim 14 does not make this recitation. Claim 14 recites two different MR elements each of which is layered with ferromagnetic and nonferromagnetic layers. Thus, it is each of the MR elements which are magnetoresistive, not a nonferromagnetic layer by itself.

E) The examiner asserts that the source of the voltage and output of claims 14, 24, 34 and 44 is unclear because there is no structure recited to generate

these parameters. Claim 14 recites that a difference in voltage between the two MR elements is caused by currents flowing therein. It does not matter for definiteness how these currents are generated. All that matters is that currents flowing in the MR elements produce different voltages measurable by the MR elements. The scope of these claims is not made indefinite by not reciting the source of the currents flowing in the MR elements.

F) The examiner argues that it is not clear how a permanent magnet or nonferromagnetic layer is formed through the nonferromagnetic layer as in claim 3, for example. Claim 3 does not recite that a permanent magnet is formed through a nonferromagnetic layer. Claim 3 recites that a nonferromagnetic metal layer is formed through a nonferromagnetic insulating layer in a manner that causes a current flowing in the metal layer to induce a bias field which is applied to the multilayer film. The specification makes it clear how these two nonferromagnetic layers are made to effect the desired result. Therefore, we see no merit in the examiner’s position on this point.

G) The examiner asserts that the nonferromagnetic layers of claim 3 are unclear and indefinite. We agree with appellants' response that it is clear that a current flows in the metal layer which induces a bias field which is applied to the multilayer film. We find nothing indefinite in this recitation.

H) The examiner questions whether the permanent magnet layer of claim 1 is the same as the ferromagnetic layer. The ferromagnetic layers are described as forming part of the multilayer film. The permanent magnet is recited as being formed on a nonferromagnetic layer which is formed "on the multilayer film." Thus, it is clear that the permanent magnet is different from any of the ferromagnetic layers which comprise the multilayer film in claim 1.

In summary, we have found no merit in any of the examiner's findings of lack of clarity and indefiniteness. Therefore, we do not sustain the rejection of all the claims under 35 U.S.C. § 112.

2. The rejection of claims 1-3 and 6-45 under 35 U.S.C. § 101 [answer, pages 6-7].

This rejection is based on the examiner's belief that the invention as disclosed is inoperative and therefore lacks utility. More particularly, the examiner asserts that a bias can only refer to a voltage, and the permanent magnet of claim 1 cannot generate a bias voltage. The examiner also asserts that the sources of voltage and current in claims 3 and 14 appear to be within the multilayer film with no external sources which violates the laws of thermodynamics.

With respect to the first point raised by the examiner, the specification of this application makes it clear that the whole invention is based on the generation of a magnetic bias field in an MR element multilayer film. The examiner's finding that a bias must be a voltage and cannot be a magnetic field is unwarranted by the record in this case. When the appealed claims use the term bias field, it is clear that they are referring to a magnetic bias field. There is nothing inoperative in the recitation of such a bias field.

With respect to the second point raised by the examiner, claim 3 recites that a current flowing in a nonferromagnetic metal layer of an MR element induces a bias field which is applied to the multilayer film. We see no

reason why the claim must recite where or how these currents were created. It does not matter what the source of the current is as it forms no part of the invention. There is no question that a current flowing in a device of the type recited will induce a magnetic bias in the MR element. Therefore, there is no violation of the laws of thermodynamics as asserted by the examiner.

Since we find the invention of the appealed claims to be fully operative, we do not sustain the rejection of the claims as lacking utility.

> 3. The rejection of claims 1-45 under 35 U.S.C. § 112, first paragraph, for the reasons set forth in the objections to the specification [answer, pages 7-8].

The answer includes a second brief rejection of the claims under 35 U.S.C. § 112 as failing to provide an enabling disclosure. The examiner asserts that the disclosure does not set forth any structure which would provide an output, voltage, current or voltage difference. However, the specification describes how currents generated in the MR element create measurable differences in the output voltage of the element. We fail to see why the person skilled in this

art would be unable to make and use the invention based on this disclosure.

With respect to the examiner's observation that the specification as originally filed does not support the bias field to be generated by a permanent magnet layer, we are of the view that the description of a permanent magnet forming part of the mutilayer element on pages 20-22 of the specification clearly establishes that the inventors were in possession of the claimed invention as of the filing date of this application. Therefore, we do not sustain this separate rejection of the claims under the first paragraph of 35 U.S.C. § 112.

> 4. The rejection of claims 1-45 under 35 U.S.C. § 103 as being unpatentable over the teachings of Shinjo [answer, pages 8-10].

With respect to independent claim 1, the examiner argues that Shinjo has the same layers as appellants' invention so that the same bias field is inherently present. The examiner also calls the cobalt layer (the hard component) of Shinjo a permanent magnet. The cobalt layer is clearly not a permanent magnet because Shinjo notes that the magnetization

of the hard component changes with increase of the magnetic field [page 3062, 2nd column]. In fact, there is nothing in Shinjo which can be called a permanent magnet. Since claim 1 clearly recites a permanent magnet layer, and since Shinjo does not suggest any permanent magnet be attached to the multilayer element, the examiner has failed to establish a prima facie case of the obviousness of claim 1. The examiner has not addressed the obviousness of attaching a permanent magnet to the MR element of Shinjo. Therefore, we do not sustain the prior art rejection of independent claim 1. Since claims 2, 6-13 and 15 depend from claim 1, we also do not sustain the rejection of these claims.

With respect to independent claim 3, the examiner argues that the Shinjo layers are the same as the claimed invention and that it appears that some mixture of insulating layer and metal layer is formed. The examiner concludes that any difference between the invention of claim 3 and Shinjo is the result of the process of making the MR element and cannot give patentability to the claimed product. Claim 3 recites that a nonferromagnetic metal layer is formed through a nonferromagnetic insulating layer so that a current flowing in

the nonferromagnetic metal layer induces a bias field which is applied to the multilayer film. Although Shinjo teaches alternating ferromagnetic layers with nonferromagnetic layers, Shinjo suggests nothing about the nonferromagnetic layers being both metal and insulating and connected in the claimed manner. The examiner's conclusion that the structure of claim 3 is the same as the Shinjo structure is not supported by the facts of record. Thus, we also do not sustain the prior art rejection of independent claim 3. Since claims 16-23 and 25 depend from claim 3, we also do not sustain the prior art rejection of these claims.

With respect to independent claim 4, the examiner asserts that the Shinjo MR element is the same as the claimed element, and that the discovery of a new property cannot impart patentability to the element itself. Claim 4 recites a multilayer element which has a property regarding the angle between a hard axis direction and a direction for detecting an external magnetic field to be detected by the MR element. Unlike our discussion of the art rejection of claims 1 and 3 above, claim 4 does not recite any additional component of the MR element which creates this property. In the absence of any

recited element in claim 4 in addition to the ferromagnetic and nonferromagnetic layers, we are unable to see how the structure of claim 4 patentably distinguishes over the Shinjo multilayer element. Appellants have not pointed to any specific structure recited in claim 4 which patentably distinguishes claim 4 from the MR element of Shinjo. Therefore, we sustain the prior art rejection of independent claim 4. Since claims 29, 30 and 33 are grouped with claim 4, we also sustain the prior art rejection of these claims.

With respect to dependent claims 26 and 27, appellants argue that the examiner has not addressed the claimed different ferromagnetic layers. However, Shinjo clearly teaches that his MR element is made from mixed ferromagnetic layers of a nickel alloy and cobalt. These layers are known to have different coercive forces and different anisotropic magnetic fields. Therefore, we sustain the prior art rejection of claims 26 and 27. With respect to dependent claims 31 and 32, these claims recite the same ferromagnetic layers as claims 26 and 27 but add a recitation of the angle between the easy axis directions and the ferromagnetic layers. The angle recitation of these claims does not add a structural

limitation which is not present in the Shinjo device. Therefore, we also sustain the prior art rejection of claims 31 and 32.

With respect to dependent claim 28, appellants argue that Shinjo fails to address the limitation of a permanent magnet as recited in the claim. As we noted in our discussion of claim 1 above, we agree that Shinjo does not suggest the use of a permanent magnet, and the examiner has not addressed the obviousness of modifying the Shinjo MR element to have a permanent magnet. Therefore, we do not sustain the rejection of claim 28. With respect to dependent claim 35, appellants argue that Shinjo does not suggest the claimed lattice mismatch between the ferromagnetic and nonferromagnetic layers. The examiner responds that the Shinjo MR element and the claimed MR element would inherently have the same lattice structure. We agree. Appellants' disclosure makes it clear that the amount of lattice mismatch to a known ferromagnetic layer is a function of the composition of the nonferromagnetic layer. That is, Table 3 of the specification notes that a nonferromagnetic layer of Cu causes a lattice mismatch of 1.77%. Since Shinjo teaches that the nonferromagnetic layers

of his device are made from Cu and the ferromagnetic layers are of the same composition as the claimed invention, the examiner is correct to conclude that the lattice mismatch in Shinjo would be the same as in appellants' invention. Therefore, we sustain the rejection of claim 35.

With respect to independent claim 5, the examiner again argues that the Shinjo composition is the same as the claimed invention regardless of the properties set forth in the claim. Claim 5 recites a means for applying a bias field to the multilayer film so that a specific property is realized. The last paragraph of 35 U.S.C. § 112 mandates that a means in a claim must be construed to cover the corresponding structure described in the specification and equivalents thereof. The means for applying a bias field to the multilayer film is described in the specification as being one or more of a permanent magnet, a shunt bias or an inductive field with current. Each of these bias means requires structure apart from the ferromagnetic and nonferromagnetic layers of the MR element itself. Shinjo only discusses the procedure of applying an external magnetic field to the MR element. Shinjo offers no suggestion of applying a

bias field to the MR element using a structure of the type disclosed or an equivalent thereof. Once again, the examiner's conclusion that the Shinjo element inherently has the properties recited in the claim is pure speculation and is not supported by the record in this case. Thus, we do not sustain the prior art rejection of independent claim 5. Since claims 36-43 and 45 depend from claim 5, we also do not sustain the prior art rejection of these claims.

With respect to independent claim 14, the examiner asserts that the Shinjo MR element must operate in the same manner as the claimed invention. Claim 14 recites that there are two MR elements forming an MR device which has specific claimed properties. Shinjo only discusses a single MR element. The examiner has not addressed the obviousness of an MR device having two MR elements as recited in claim 14. Thus, the examiner has again failed to establish a prima facie case of the obviousness of claim 14. Therefore, we do not sustain the prior art rejection of independent claim 14. Since claims 24, 34 and 44 depend from claim 14, we also do not sustain the rejection of these claims.

In conclusion, we have not sustained any of the examiner's rejections of claims 1-45 under 35 U.S.C. § 112 or § 101. The rejection of claims 1-45 under 35 U.S.C. § 103 has been sustained with respect to claims 4, 26, 27, 29-33 and 35, but has not been sustained with respect to claims 1-3, 5-25, 28, 34 and 36-45. Therefore, the decision of the examiner rejecting claims 1-45 is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

JERRY SMITH Administrative Patent Judge	)
LEE E. BARRETT Administrative Patent Judge	) BOARD OF PATENT) APPEALS AND) INTERFERENCES

MICHAEL R. FLEMING)
Administrative Patent Judge)

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